

**REMARKS**

Claims 1-3 and 7-9 are pending in this application on the merits. Claims 1, 2, and 9 have been amended to more clearly recite the claimed embodiments. Claims 4-6 were previously canceled without prejudice or disclaimer. Claim 8 was previously withdrawn from further consideration. Support for the amendments of the claims can be found in the specification as filed. Support for the amendments of claims 1, 2 and 9 can be found, for example, at page 5, lines 2 to 6. Applicants reserve the right to file one or more divisional or continuation applications to any withdrawn or cancelled subject matter that appeared in the application as originally filed. No new matter has been added.

**I. The Rejection of Claims Under 35 U.S.C. § 103(a) Should be Withdrawn**

Claims 1-3, 7 and 9 are rejected under 35 U.S.C. § 103 (a) as allegedly being obvious over Nakao (Chemistry Letters, pp 766–767 (2000)) (“Nakao”) in view of Zhou (Journal of Nanoparticle Research, pp 379-383 (2001)) (“Zhou”) and further in view of Beauvois (Nuclear Instruments and Methods in Physics Research Section B, 131(1), pp 167-171 (1997)) (“Beauvois”) or Hanus (Applied Surface Science, pp 320-323 (2000)) (“Hanus”).

Applicants respectfully submit that the above described references fail to teach or suggest every limitation and element of the present pending claims or to give one of ordinary skill in the art a reasonable expectation of success in producing the claimed invention (*see In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974); *Yamanouchi Pharmaceutical Co. v. Marsam Pharamceuticals, Inc.*, 231 F.3d 1339 (Fed. Cir. 2000)).

Nakao discloses heating polymethylmethacrylate (PMMA) sheet with Pd-AA vapor, followed by the requisite post-heating treatment to convert the dissolved Pd-AA in PMMA to Pd clusters. Nakao does not teach or suggest the use of ultraviolet radiation, much less a process including the two separate steps of (1) irradiating PMMA with ultraviolet radiation to increase the reducing power toward a heavy metal compound, then subsequently (2) contacting the ultraviolet-irradiated portion of the PMMA with a heavy metal.

Zhou teaches a method of producing a polymer-Au composite by irradiating a solution containing HAuCl<sub>4</sub>, acrylamide and a polymerization initiator with ultraviolet radiation to

proceed with the simultaneous reduction of the gold ion and polymerization of the acrylamide. The claimed invention is distinguished from Zhou in several ways. First, Zhou's mechanism of irradiating metal clusters is different from the present invention. Zhou's procedure requires formation of a pre-irradiation solution of the radical initiator AIBN, acrylamide (AM), and  $\text{HAuCl}_4$  or  $\text{PdCl}_2$  (*see* Zhou, page 380, left column, second paragraph). In Zhou's method, metal salts are directly reduced by an action of the ultraviolet irradiation. It is known that  $\text{HAuCl}_4$  is reduced by ultraviolet radiation to precipitate Au. On the other hand, in the present invention the metal complex is not directly reduced by the ultraviolet radiation. The present invention irradiates PMMA to increase the reducing power toward heavy metal compounds, thus avoiding the formation of a pre-irradiation aqueous solution (*see* specification lines 14-17 at page 2). Second, the PMMA recited in the present invention is not applicable in Zhou's irradiation system. Zhou utilizes gradually formed soluble PAM to stabilize and separate the metal clusters, thus preventing them from aggregation and growth (*see* Zhou, page 381, left column, first paragraph). Zhou's irradiation method is not applicable to PMMA for forming a Pd-cluster because PMMA is not soluble in water and cannot stabilize or separate the metal clusters. On the contrary, the insoluble PMMA aggravates the precipitation of metal clusters that Zhou tried to resolve. Third, Zhou teaches using a significantly higher dose of UV irradiation than used in the present invention. In the method of Zhou, the ultraviolet radiation dose corresponds to about 5,184,000 J (calculation is based on the energy of 30 W mercury lamp for 48 hours, *see* Zhou, page 380, left column, second paragraph), which is remarkably different from the extremely small dose, 0.1 to 2  $\text{J}/\text{cm}^2$ , recited in the present claims. This is clear, despite the difference in units between the two doses. Accordingly, Zhou fails to fill-in all of the deficiencies of Nakao and fails to teach every limitation and element of the pending claims. Moreover, for the reasons discussed above, there would be no reasonable expectation of success in using Zhou's method to achieve the present invention because of insoluble PMMA and the significantly different irradiation doses employed in different reduction mechanisms.

Beauvois teaches the PMMA-copper acetylacetonate composite films by pyrolysis or photolysis. Beauvois requires the formation of the PMMA-copper acetylacetonate composite films before irradiation by dissolving PMMA and  $\text{AcAcCu}$  in  $\text{CHCl}_3$  (*see* Beauvois, left column

at page 168). Hanus teaches the irradiation of CuAcAc embedded in PMMA (*see* Hanus, right column at page 320 and left column at page 321). Both Beauvois and Hanus require the formation of the CuAcAc-PMMA cluster or film before irradiation, whereas the claimed invention is directed to a substrate unassociated or unembedded with the heavy metal compound prior to irradiation (see Examples 1 and 2 at page 10). Therefore, neither Beauvois nor Hanus fills in the deficiencies present in the combination of Nakao and Zhou. Accordingly, neither Beauvois nor Hanus teaches or suggests each and every limitation of the claimed invention. Indeed, Beauvois and Hanus teach away from the claimed invention by requiring formation of the pre-irradiation solution.

Further, Nakao, Zhou, Beauvois and Hanus are not combinable to give one of ordinary skill in the art a reasonable expectation of success in producing the claimed invention that has the advantageous mechanism of using PMMA to achieve significantly low irradiation dose for reducing metal clusters. Accordingly, none of the cited references, alone or in combination, teaches or suggests the present invention with reasonable expectation of success.

Therefore, Applicants respectfully submit that the rejections of amended independent claims 1, 2, and 9 as well as the corresponding dependent claims under 35 U.S.C. § 103 (a) should be reconsidered and withdrawn.

**CONCLUSIONS**

It is respectfully submitted that all claims are now in condition for allowance, early notice of which would be appreciated. Should the Examiner disagree, Applicants respectfully request a telephonic or in-person interview with the undersigned attorney to discuss any remaining issues and to expedite the eventual allowance of the claims.

Except for issues payable under 37 C.F.R. 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account 50-0310.

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